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The Red Kite (*Milvus milvus*) Reintroduction Project: Modeling the Impact of Translocating Kite Young Within England

Ian Carter, Mick McQuaid, Nigel Snell and Peter Stevens
English Nature, Northminster House, Peterborough PE1 1UA, U.K.

Key Words: *Red Kite;* Milvus milvus; *reintroduction; translocations; England.*

The Red Kite (*Milvus milvus*) reintroduction project started in 1989 with the release of six Swedish kites at a site in northern Scotland and four Swedish and one Welsh kite at a site in southern England (Evans et al. 1991). From 1989–94, a total of 93 birds were released at each site with southern England birds coming mainly from Spain and northern Scotland birds from Sweden (Evans et al. 1997). As a result of these releases, small populations have been successfully established in both release areas. In 1997, the southern England breeding population reached about 55 pairs and is now considered to be self-sustaining.

In order to improve the status of Red Kites in Britain and to increase their spread to other suitable areas, releases have started at two new sites in central Scotland and the English midlands (Carter 1995). At the latter site, a total of 29 birds, mainly from Spain, were released in 1995 and 1996. In 1997, another 10 kites from Spain were released but, due to concerns about declines in the Red Kite population in parts of Spain, Spanish authorities decided that it would be difficult for them to supply kites for the project in future years. Discussions with the recently formed Welsh Kite Trust led to an agreement that young rescued from vulnerable nests and for which suitable foster nests could not be found within Wales would be made available for translocation to the English midlands release site. However, this would involve only a few birds and, in some years, no young would be available for the reintroduction project.

In order to make up this short-fall of birds for release, the translocation of young kites from the expanding southern England population was considered. To help assess the impact of any such translocations, we devised a simple model to show the likely effects on the southern England and midlands populations. Various scenarios were modeled, reflecting the range of options available.

Methods

The model used the following data and assumptions based mainly on monitoring work on the expanding southern England kite population up to 1996 (Evans et al. 1997, N. Snell, M. McQuaid and P. Stevens unpubl. data): (1) 76% survival in the first year based on sightings of individually-identifiable, wing-tagged kites, released between 1989–94 (N = 93); (2) 93.5% adult survival based on sightings of individually-identifiable, wing-tagged kites in their second and subsequent years (N = 136); (3) breeding productivity of 2.1 young per breeding attempt between 1991–96 (N = 94); (4) balanced immigration and emigration (this seemed reasonable because Red Kites are known to have a very high level of natal philopatry [Newton et al. 1994]. No wing-tagged kites released or fledged in southern England have yet been found breeding elsewhere, although because some released birds have now lost their tags and not all young are fitted with tags each year, it is possible that a small number of cases have gone undetected; at least one continental immigrant is known to have been recruited into the southern England breeding population [I. Evans pers comm.]); (5) age of first breeding at two years (in the southern England population, kites have occasionally bred in their first year but normally attempt to breed for the first time in their second year; in Wales where the habitat is less suitable, kites have been recorded breeding

Table 1. Estimated number of breeding pairs of Red Kites in the southern England and the English midlands using the model assuming that 20 young kites are translocated from the southern England population.

YEAR	S. ENG.—DO NOTHING	S. ENG.—REMOVE 20 CHICKS IN 1997	MIDLANDS—RELEASE NO BIRDS IN 1997; 20 IN 1998 AND 1999	MIDLANDS—RELEASE 20 BIRDS EACH YEAR 1997 TO 2000
1997	50	50	3	3
1998	75	75	9	9
1999	108	100	11	18
2000	157	150	24	30
2001	227	215	37	48
2002	329	313	52	68

for the first time at up to seven years of age [Newton et al 1987]); (6) equal sex ratio (a population of 40 birds, two years or older was assumed to have 20 breeding pairs).

Since it was a simple, deterministic model, density-dependent effects and stochastic events were not taken into account, although their implications were considered.

The starting point for each scenario was the estimated kite population in southern England and the midlands in 1997, including the number of breeding pairs and the number of surviving young fledged from nests in 1996. For each year (x), the population in the following year (x + 1) was calculated by summing the following values derived from the data and assumptions: (1) number of breeding adults surviving from year x to year x + 1; (2) number of young fledged in year x − 1 surviving to breed for the first time in year x + 1; (3) number of young fledged in year x surviving to year x + 1. In each case, the number of young removed or added to the population under a given scenario was taken into account in (2) and (3).

RESULTS

Scenario 1. Remove 20 young from the southern England population in 1997 and release them in the midlands. We assumed that no further birds were translocated from southern England in subsequent years but 20 birds from an alternative donor population were released in the midlands in 1998 and 1999. By the year 2002, this translocation resulted in an increase of 31% in the number of pairs in the midlands compared to the release of no birds in 1997 (Table 1). The removal of the 20 birds from southern England resulted in a 4.9% decrease in that population. The effect of releasing the extra birds in the midlands was most noticeable in the years 1998 to 1999 when the population increased from nine to 18 pairs as opposed to an increase from nine to only 11 pairs if no birds were released.

Scenario 2. In this scenario, no further birds were available for release in the midlands from sources outside southern England. Fifteen birds were taken from southern England and released in the midlands in each year between 1997–99. In this example, the release of 15 birds in the midlands each year between 1997–99 resulted in a 74% increase in the midlands population by 2002 compared to doing nothing (Table 2). The loss of the 15 birds in each of three years from southern England resulted in a population reduction from 328 pairs to 303 pairs in 2002, a difference of 8%.

In both the above scenarios, because the model does not take into account any density-dependent effects, the number of kites gained by the midlands population exactly matches the number lost to the southern England population. The percentage difference was, however, much greater for the midlands population than the well-established southern England population.

Table 2. Estimated number of breeding pairs of Red Kites in southern England and the English midlands assuming that 15 birds are taken from southern England and released each year from 1997–99.

YEAR	S. ENG.—DO NOTHING	S. ENG.—REMOVE 15 CHICKS IN 1997, 1998 AND 1999	MIDLANDS—DO NOTHING	MIDLANDS—RELEASE 15 BIRDS IN 1997, 1998 AND 1999
1997	50	50	3	3
1998	75	75	9	9
1999	108	102	11	16
2000	157	146	17	27
2001	227	207	23	42
2002	329	303	34	59

DISCUSSION

One of the requirements of any well-planned reintroduction project is that it should be adequately monitored (IUCN 1987). This not only ensures that any problems will be identified and resolved at an early stage but also facilitates decisions about the future of the project. Use of this simple model was only possible because the basic population and survival data were available from monitoring work on the southern England Red Kite population.

The model proved to be a valuable aid to decision making when considering the various options for translocating Red Kites for release in the midlands and, in particular, the option of taking birds from southern England in 1997. Having used the model to help consider the potential impact of translocating 10 birds in 1997, kite workers involved with the project agreed that the translocation should go ahead. It was accepted that the translocated birds would significantly improve the status of the small, vulnerable midlands population without having a significant impact on the larger donor population. In effect, the birds were thought to be more valuable in helping to meet the project's overall aim of restoring kites to all suitable habitats in Britain if they were translocated and released in the midlands. Ten young were taken under licence from nests in June 1997 and have been released into the midlands along with the 10 birds imported from Spain.

In order to minimize any impact on the southern England population, only the smallest young were taken from broods of two or three (broods of four occur only very occasionally). In one case, the two smallest young were taken from a brood of three. With many species of birds of prey and owls, the smallest young are vulnerable to being eaten by their siblings if there is a shortage of food (Newton 1979, Cramp and Simmons 1980, Cramp 1985, Watson 1997), and this has been recorded in the Welsh kite population (Lovegrove et al. 1990). Most deaths due to aggression from siblings would be expected when young are still small, and deaths are much less likely when the chicks are four wk or older, the age at which the kites were collected from nests. Nevertheless, it is still possible that some young taken from southern England would not have fledged successfully if left in nests. In captivity, it was possible to provide the young with a surplus of food and prevent any problems due to food shortage.

Because our model is purely deterministic, the year to year population changes were solely dependent on the set of population parameters derived from monitoring the southern England population. No possible effects of chance, stochastic, events acting on the population were considered. While chance events are unlikely to effect the relatively large southern England population significantly, this is certainly not the case in the early years in the midlands while the population is still small. An outbreak of disease in the midlands could wipe out the tiny breeding population completely by causing the deaths of only a handful of adult kites. This emphasizes the importance of ensuring that the vulnerable midlands population increases to a level at which such stochastic effects are less significant.

The model considered the impact of the translocation options on Red Kites in southern England and the midlands separately. However, given the stated aims of the project to reestablish the Red Kite throughout Britain, the translocation of birds should not be viewed as a loss to one area and a gain for another. In the long-term, translocated birds will form part of a single, larger British population. Although unrealistic, it is interesting to run the model for a longer period of time. If this is done for the southern England population under the "do nothing" scenario, then the population would reach 14 250 pairs in 2012 and 93 700 pairs by 2017. The population will clearly not reach such levels as quickly as predicted by the model because we can expect increasing competition among kites as the population expands in both numbers and range. This would likely increase age of first breeding, reduce levels of breeding productivity and reduce survival rates (Newton 1979), thus slowing the rate of population increase.

RESUMEN.—Un modelo determinístico simple fue utilizado para evaluar los resultados potenciales del traslado de *Milvus milvus* en Inglaterra como parte del proyecto de reintroducción de la English Nature/Royal Society for the Protection of Birds (RSPB). El modelo utilizó datos de sobrevivencia y productividad para el monitoreo de la población en expansión al sur de Inglaterra y demostró que el traslado de pequeños números de aves tienen poco efecto en esta población, pero si para la población de la región central. Dos escenarios incluyendo el traslado de distintos números de aves en períodos diferentes son presentados como ejemplos de como el modelo puede ser usado para evaluar las diferentes opciones. Al utilizar los resultados del modelo, la decisión fue la de trasladar los primeros 10 juveniles del sur de Inglaterra a la región central en 1997.

[Traducción de César Márquez]

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FIRST RECORDED POLYGYNOUS MATING IN THE RED KITE (*MILVUS MILVUS*)

HEIN VAN KLEEF[1] AND JAVIER BUSTAMANTE
Department of Applied Biology, Estación Biológica de Doñana, CSIC, Avda. María Luisa s/n, 41013 Sevilla, Spain

KEY WORDS: *Red Kite*; Milvus milvus; *bigamy*; *polygyny*; *Doñana, Spain.*

Diurnal birds of prey are predominantly monogamous (Newton 1979). Alternative mating systems like polygyny, polyandry, or cooperative breeding are rare, but have been recorded in at least 16 species of raptors (Newton 1979, Faaborg and Bednarz 1990, Heredia and Donázar 1990, Tella 1993, Tella et al. 1996). Nonmonogamous relationships are easily overlooked when working with unmarked individuals and are almost certainly more widespread than published records show (Newton 1979). Polygyny in birds of prey has only been regularly observed in harriers (*Circus* spp.) although it has been occasionally recorded in another nine species (Newton 1979, Hiraldo et al. 1991, Tella et al. 1996) and seems to be associated with relatively productive habitats with an abundant food supply.

The Red Kite (*Milvus milvus*) is considered a monogamous raptor and to our knowledge no instances of polygyny have been reported previously (Glutz von Blotzheim et al. 1971, Newton 1979, Cramp and Simmons 1980). According to Glutz von Blotzheim et al. (1971) and Cramp and Simmons (1980), both adults build nests. Incubation is mainly done by females although males may incubate for short periods during the day. Males bring prey to females and defend nest sites during incubation and the first two weeks after hatching while females brood and feed the young. Later, both members of pairs defend nest sites and bring food to nests, where the young feed themselves. On average, young fledge 55 d after hatching and are fed by both parents for another 26 d in the vicinity of the nest (Bustamante 1993). The entire hunting territory is not defended, but Red Kites defend areas surrounding nest sites at least until the young become independent (Bustamante and Hiraldo 1993).

In 1996 and 1997, we recorded the presence of a po-

[1] Present address: Burghardt van den Berghstraat 163, 6512 DK, Nijmegen, The Netherlands.